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TELEOSTEAN OTOLITHS FROM THE LATE CRETACEOUS (MAESTRICHTIAN AGE) SEVERN FORMATION OF MARYLAND

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Abstract.—Approximately 1000 teleostean fish otoliths were recovered from the Severn Formation, Late Cretaceous (Early–Middle Maestrichtian) of Maryland. These otoliths represent at least 14 kinds of fishes belonging to eight families (Pterothrissidae, Argentinidae, Ariidae, Ophidiidae, Polymixiidae, Trachichthyidae, ?Pempheridae, and Apogonidae) and three unidentified families, suborders Albuloidei, Stomioidei, and Anguilloidei. Otoliths of *Vorhisia* sp. dominated the fauna, representing approximately 54 percent of the total identified otoliths. The next dominant form, represented by the Apogonidae, comprised 27 percent of the identified fauna.

Previous description of teleostean otoliths from the Late Cretaceous of North America are limited. Frizzell (1965a) described *Prealbula weileri* and *Protalbula sohli,* based on isolated sagittae from the Earliest Campanian, Eutaw Formation of Alabama. Frizzell (1965b) described *Vorhisia vulpes,* based on isolated lapilli from the Maestrichtian, Fox Hills Sandstone Formation of South Dakota. Frizzell and Koenig (1973) described asterisci from the same formation and assigned them to *V. vulpes.* These asterisci, however, do not belong to *Vorhisia* (J. E. Fitch, pers. comm.). Huddleston (1981) described *Bernardichthys zorraquinosi,* based on sagittae from the Early Cenomanian, Bernard Formation of Oregon.

The present study is based on approximately 1000 otoliths recovered from about 100 kg of fossiliferous matrix collected from an exposure at the base of the Severn Formation by one of us (KMS). All field samples were collected from LACM (Los Angeles County Museum, section of Vertebrate Paleontology) locality 4425; Beltway exit 34W, Central Avenue, Prince George County, Maryland. The locality was initially exposed by the cutting action of a small unnamed creek. Construction activities have increased the exposure. Samples were taken from a 30 cm thick section of scattered shell and small lenses of dark gray shell marl, mixed with broken shell.

The term Severn Formation was first proposed by Denton (1891) for a variety of lithologic units. Clark, Bagg and Shattuck (1897) later proposed the term Monmouth Formation for certain lithologic units occurring in New Jersey. This term also was applied to Late Cretaceous marine strata in Maryland. Recently Minard, Shol, and Owens (1978) reintroduced the term Severn Formation to replace the term Monmouth Formation in Maryland. The Severn Formation is Late Cretaceous, Early-Middle Maestrichtian and corresponds to the Navarroan Provincial stage (Brouwers and Hazal 1978).

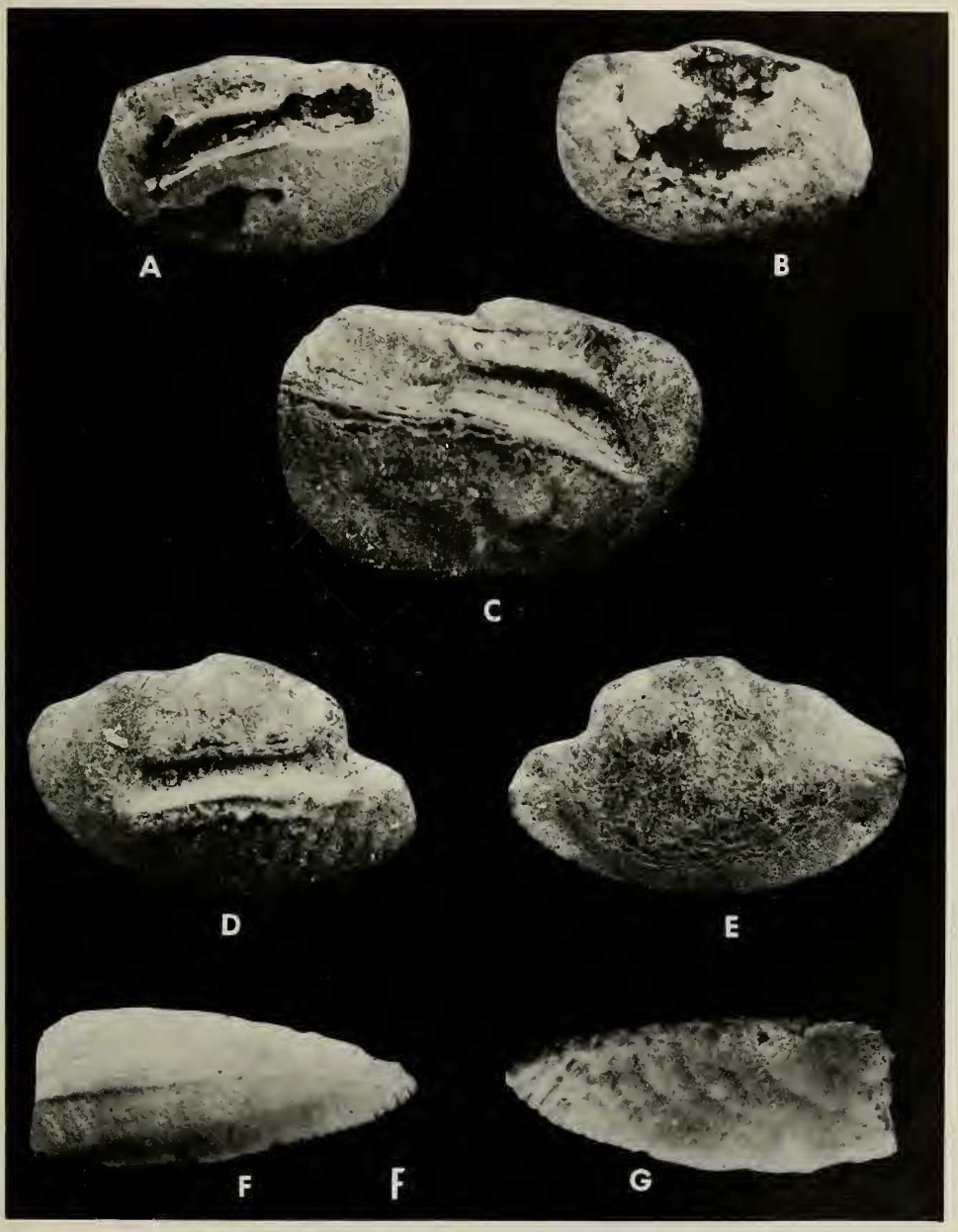

Fig. 1. A, B, Pterothrissidae, left sagitta, 15.4mm, LACM 4425/120101 (A-innerface; B-outerface); C, Pterothrissidae, right sagitta, 11.5mm, LACM 4425/116980; D, E, Anguilloidei-A, left sagitta, 10.5mm, LACM 4425/116981, (D-innerface; E-outerface); F, G, Albuloidei, left sagitta, 7.4mm, LACM 4425/116979 (F-innerface; G-outerface).

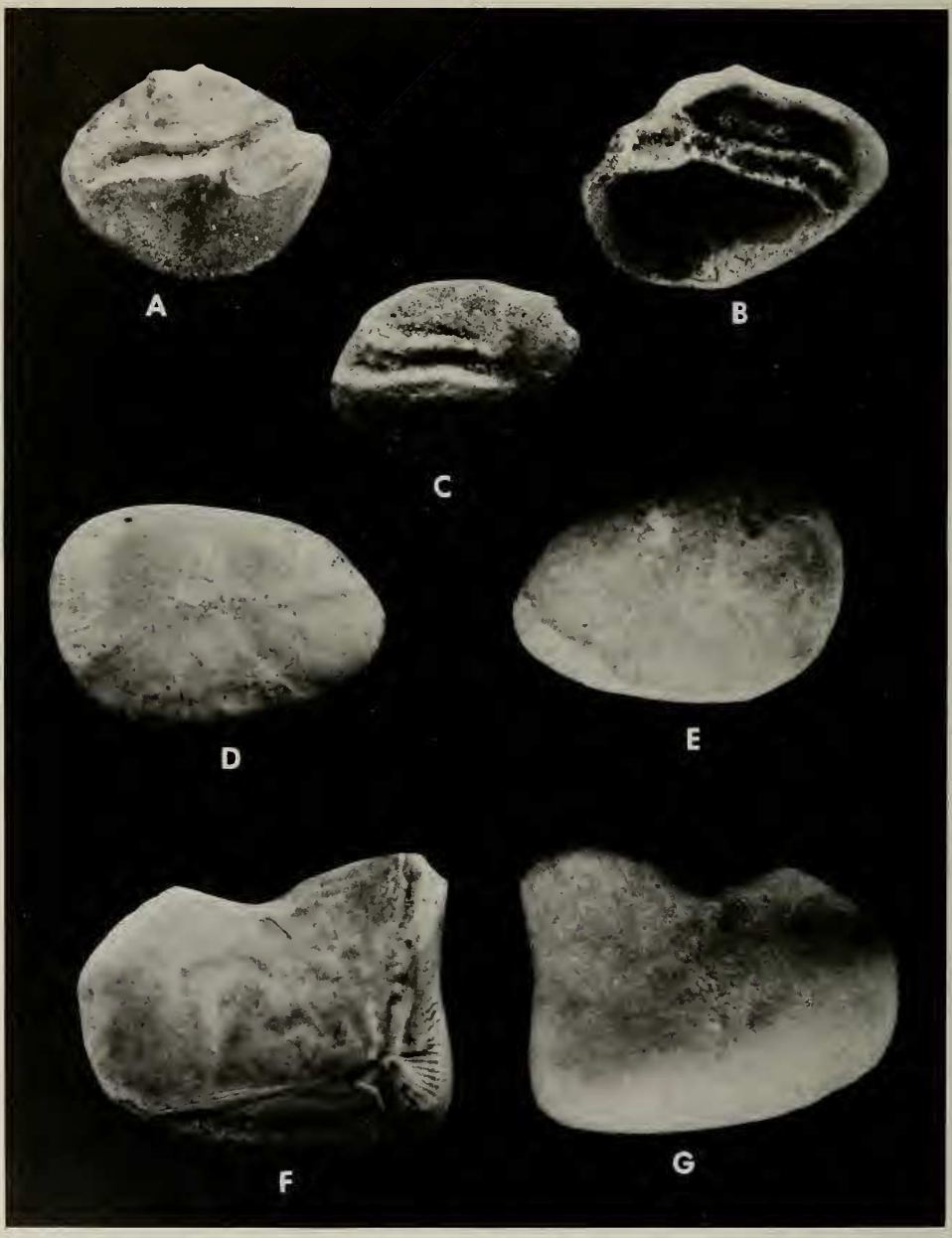

Fig. 2. A, cf. Pempheridae, left sagitta, 4.0mm, LACM 4425/116990; B, Polymixiidae, right sagitta, 4.5 mm, LACM 4425/116988; C, Anguilloidei-B, right sagitta, 6.1mm. LACM 4425/116983; D, E, Ariidae, right lapillus, 4.9mm, LACM 4425/116985 (D-innerface; E-outerface); F, G, *Vorhisia* sp., left lapillus, 25mm, LACM 4425/116984 (F-innerface; G-outerface).

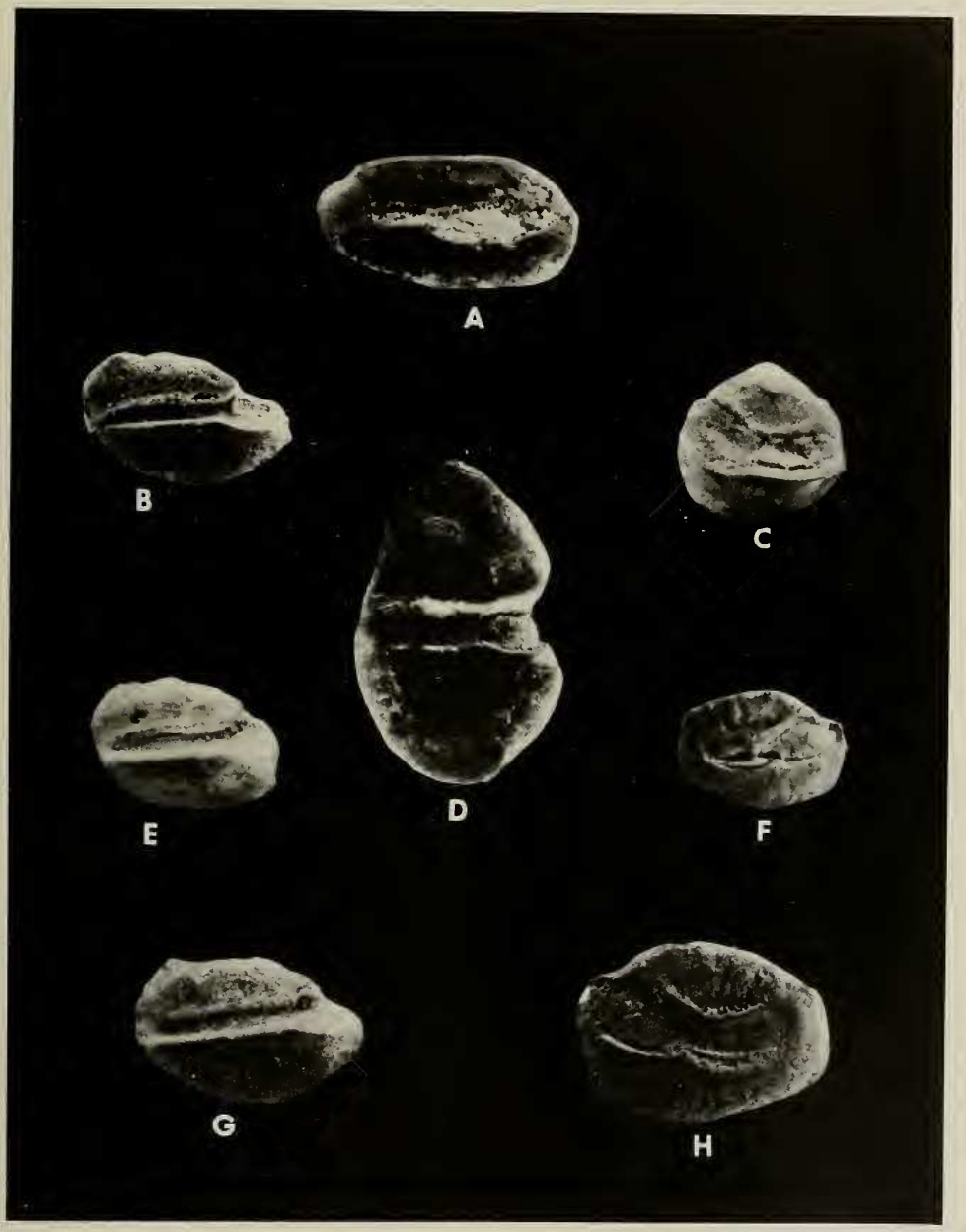

Fig. 3. A, Ophidiidae, right sagitta, 4.0mm, LACM 4425/116987; B, Argentinidae, left sagitta, 3.0mm, LACM 4425/116983; C, near-Apogonidae-B, right sagitta, 2.5mm, LACM 4425/116994; D, Stomioidei, left sagitta, 3.1mm, LACM 4425/116993; E, Argentinidae, left sagitta, 2.79mm, LACM 4425/120115; F, near-Apogonidae-A, left sagitta, 2.5mm, LACM 4425/116991; G, Argentinidae, left sagitta, 3.42mm, LACM 4425/120116; H, near-Apogonidae-A, right sagitta, 3.42mm, LACM 4425/116992.

Taxa	Number of otoliths	Figure
Pterothrissidae	12	fig. 1A–C
Albuloidei	13	fig. 1F–G
Anguilloidei-A	2	fig. 1D–E
Anguilloidei-B	2	fig. 2C
Argentinidae	3	fig. 3B, E, G
Stomioidei	4	fig. 3D
Ariidae: *Vorhisia* sp.	596	fig. 2F–G
Ariidae: unidentified	82	fig. 3A
Polymixiidae	11	fig. 2E
Trachichthyidae	63	not figured
c.f. Pempheridae	1	fig. 2A
Apogonidae-A	190	fig. 3F, H
Apogonidae-B	106	fig. 3C

Discussion

The ichthyofauna of the Severn Formation as defined by the otoliths, was dominated by the family Ariidae, with approximately 54 percent of the otoliths of a single genus, *Vorhisia* sp. Waage (1968) noted *Vorhisia* as a brackish and freshwater indicator. While *Vorhisia* sp. dominated the ichthyofauna all of these otoliths displayed varing degrees of attrition. The extent of potential postmortem transportation is not determinable. It is possible that these otoliths were washed in from a shallower area. However, it is unlikely that this *Vorhisia* sp. represented a freshwater species.

The albuloid sagittae were uncommon in the Severn samples and while the Recent Albulidae are found in warm subtropical to tropical environments it cannot be construed with any degree of certainty that the Severn albuloids occupied similar habitat without additional data. Additionally all of the albuloid otoliths displayed degrees of erosion and these otoliths may have undergone considerable postmortem transport.

The extant Polymixiidae, Apogonidae, Pempheridae, and Ariidae reflect a tropical-subtropical environment and their presence in the Severn fauna may suggest this condition. However, additional supportive data are necessary to confirm these conclusions. This late Cretaceous fauna is unusual in that its overall components more closely resemble otolith faunas observed from the Paleocene Brightseat Formation rather than the other Cretaceous age ichthyofaunas represented by otoliths (Huddleston, unpublished data).

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